

We Claim:

1. A wireless communication device comprising:

a screen display;

a memory;

a processor coupled to the screen display and the memory;

a plurality of user interface pages stored in the memory and encoded in a markup language, selected ones of the user interface pages providing access to telecommunication functions of the wireless communication device; and

a markup language browser, executed by the processor, and communicatively coupled to the memory and the screen display, that:

accesses either the stored user interface pages from the memory or remotely stored pages encoded in the markup language via a telecommunications network;

decodes accessed pages to display user interface elements on the screen display; and

effects a telecommunication function in response to a user input to a displayed user interface element.

2. An apparatus, comprising:

a shell for receiving a URL having a protocol component and a data component, the data specifying a command to be executed or content to be fetched, the shell providing the data component to a protocol handler according to the protocol component, and the fetched content to a content handler for processing;

a plurality of protocol handlers, each protocol handler coupled to the shell to receive a URL and either fetch content specified by the data component and provide the fetched content to the shell, or execute the command specified by the data component; and

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a plurality of content handlers, each content handler coupled to the shell to receive fetched content and process the fetched content to output the content to a screen display.

3. The apparatus of claim 2, wherein:

the plurality of protocol handlers include:

- a telephone protocol handler that receives a URL from the shell and decodes the URL to activate a telephony function of the communications device;
- a file protocol handler that receives a URL from the shell and decodes the URL to access data stored in a memory of the wireless communications device;
- a remote file protocol handler that receives a URL from the shell and fetches content addressed by the data component of the URL that is stored remotely from the wireless communication device; and

the plurality of content handlers include:

- a markup language content handler that receives markup language content corresponding to a URL and displays the content on the screen display.

4. The apparatus of claim 3, wherein the plurality of protocol handlers include:

- a message protocol handler that receives a URL from the shell and executes a command specified by the data to activate an alphanumeric message display or transmission function of the communication device; and
- a configuration protocol handler that receives a URL from the shell and establishes a configuration setting of the communications device according to the data component of the URL.

5. The apparatus of claim 2, further comprising:

a wireless communication device including:

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the screen display;

a memory coupled to the screen display, and storing the shell, the protocol handlers, and the content handlers; and

a processor coupled to the memory to execute the shell, the protocol handlers and content handlers.

6. A computer-implemented method of operating a wireless communications device having a plurality of keys, comprising:

receiving a first markup language page containing a tag defining an association between one of the keys and an action;

receiving a user selection of the key; and

effecting the action associated with the user selected key.

7. The method of claim 6, wherein the action is a URL having a data component, further comprising:

responsive to the data component of the URL specifying a second page to be fetched, fetching the second page, and displaying the second page; and

responsive to the data component of the URL specifying a telephony command of the wireless communication device, executing the telephony command.

8. A browser program product for controlling the operation of a wireless communication device by execution of the browser by a processor of the wireless communication device, the browser executing the operations of:

decoding a markup language page including a key tag specifying one of the plurality of keys and an action;

storing an association between the specified key and the action; and

responsive to receiving a user input of the specified key, effecting the action associated with the specified key.

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1 9. The browser of claim 8, wherein the key tag specifies a URL, and responsive
2 to user input of the specified key, the browser fetches content associated with the URL
3 and displays the content.

1 10. The browser of claim 9, wherein the key tag specifies a label associated with
2 the specified key, and the browser responsive to decoding the page, displays the label on
3 a screen display.

1 11. A computer implemented method of data processing a page of data encoded
2 in a markup language, the page including a reference to an embedded object, the method
3 comprising:

4 receiving a user selection of a displayed user interface element in the page, the
5 element associated with a URL encoded within the page, the URL
6 having a protocol component and a data component;
7 invoking the embedded object, and providing the URL to the embedded object
8 for processing; and
9 responsive to the embedded object not processing the URL, fetching content
10 specified by the data component, or executing a command specified by
11 the data component.

1 12. A computer implemented method for automatically displaying help data to a
2 user, comprising:

3 displaying a window having a title in a title bar area;
4 incrementing a counter of an amount of time elapsed since a last user input;
5 and
6 responsive to the counter equaling or exceeding a threshold amount of time,
7 replacing the title by scrolling first help data in the title bar area.

13. The method of claim 12, further comprising:
 responsive to a completion of scrolling the first help data:
 redisplaying the title in the title bar;
 resetting the counter;
 incrementing the counter of an amount of time elapsed since the last user
 input; and
 responsive to the counter equaling or exceeding the threshold amount,
 replacing the title bar by scrolling second help data in the title bar.

14. The method of claim 12, further comprising the initial steps of:
 receiving markup language page including a title tag defining the title and a
 help tag defining the first help data;
 storing the first help data; and
 displaying the markup language page in the window including displaying the
 title in the title bar.

15. A browser program product for controlling the operation of a wireless
 communication device by execution of the browser by a processor of the wireless
 communication device, the browser executing the operations of:
 decoding a markup language page including title tag defining a title of the
 page and a help tag specifying help data;
 storing the help data;
 displaying the page in a window;
 displaying the title in a title bar area of the window;
 responsive to an elapsed amount of time since a last user input exceeding a
 threshold, replacing the title in the title bar area by scrolling the stored
 help data in the title bar; and
 responsive to completion of the scrolling of the stored help data, redisplaying
 the title in the title bar area.

1 16. A computer-implemented method of operating a wireless communications
2 device having at least one softkey, comprising:

3 receiving a first user interface definition page defined in a markup language;
4 parsing the first user interface definition page, and storing an association
5 between one of the softkeys and menu of menu items, each menu item
6 associated with either a URL or an action;
7 responsive to receiving a user selection of the softkey, displaying the menu of
8 menu items;
9 responsive to user selection of a displayed menu item associated with an
10 action, effecting the action; and
11 responsive to user selection of a menu item associated with a URL, either
12 fetching data specified by the URL or effecting a communication
13 function of the wireless communication device specified by the URL.

1 17. A browser program product for controlling the operation of a wireless
2 communication device by execution of the browser by a processor of the wireless
3 communication device, the browser executing the operations of:

4 retrieving a first user interface definition page defined in a markup language;
5 parsing the first user interface definition page, and storing an association
6 between one of the softkeys and menu of menu items, each menu item
7 associated with either a URL or an action;
8 responsive to receiving a user selection of the softkey, displaying the menu of
9 menu items;
10 responsive to user selection of a displayed menu item associated with an
11 action, effecting the action; and
12 responsive to user selection of a menu item associated with a URL, either
13 fetching data specified by the URL or effecting a communication
14 function of the wireless communication device specified by the URL.

1 18. A computer implemented method for displaying a page of data, comprising:
2 receiving a first markup language page containing a tag specifying a URL
3 referencing a second markup language page;
4 fetching the second markup language page according to the URL;
5 replacing the tag with the second markup language page to form a combined
6 markup language page; and
7 displaying the combined markup language page.

1 19. A browser program product for controlling the operation of a wireless
2 communication device by execution of the browser by a processor of the wireless
3 communication device, the browser executing the operations of:
4 receiving a first markup language page containing a template tag, the template
5 tag specifying a URL referencing a second markup language page;
6 fetching the second markup language page according to the URL;
7 replacing the template tag with the second markup language page to form a
8 combined markup language page; and
9 displaying the combined markup language page.

1 20. A browser program product for controlling the operation of a wireless
2 communication device by execution of the browser by a processor of the wireless
3 communication device, the browser executing the operations of:
4 receiving a first markup language page containing an escape sequence
5 specifying a URL referencing a second markup language page;
6 fetching the second markup language page according to the URL;
7 replacing the escape sequence with the second markup language page to form
8 a combined markup language page; and
9 displaying the combined markup language page.

1 21. A computer implemented method of displaying a page of configuration
2 settings for a wireless communication device having a plurality of configurable features,
3 the method comprising:

4 receiving a markup language page including an input type tag defining an
5 input field for receiving a user input of a configuration setting, and a
6 selection attribute equal to the value of an expression including a URL
7 for a configurable feature, the selection attribute indicating whether the
8 input field is preselected;

9 fetching data associated with the URL;

10 evaluating the expression using the fetched data to determine a value of the
11 expression; and

12 displaying the page including the input field of the configuration setting
13 according to the selection attribute as pre-selected or unselected
14 according to the value of the expression.

1 22. The method of claim 21, wherein:

2 the expression has the form (selection attribute=[!]URL); and

3 evaluating the expression using the fetched data to determine a value of the
4 expression comprises:

5 converting the data associated with the URL to an integer value; and

6 evaluating the expression to obtain either a zero or non-zero value.

1 23. The method of claim 21, wherein:

2 the expression has the form (selection attribute = (URL[!]=*string*)), where
3 *string* is an arbitrary alphanumeric string; and

4 evaluating the expression using the fetched data to determine a value of the
5 expression comprises:

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6 evaluating the expression by determining if the data associated with the
7 URL is the same as the string to obtain either a zero or non-zero
8 value.

1 24. A browser program product for displaying a page of configuration settings for
2 a wireless communication device having a plurality of configurable features, the browser
3 controlling the operation of a wireless communication device by execution of the browser
4 by a processor of the wireless communication device, the browser executing the
5 operations of:

6 receiving a markup language page including an input type tag defining an
7 input field for receiving a user input of a configuration setting, and a
8 selection attribute equal to the value of an expression including a URL
9 for a configurable feature, the selection attribute indicating whether the
10 input field is preselected;

11 fetching data associated with the URL;

12 evaluating the expression using the fetched data to determine a value of the
13 expression; and

14 displaying the page including the input field of the configuration setting
15 according to the selection attribute as pre-selected or unselected
16 according to the value of the expression.

1 25. A computer implemented method for displaying a page of data, comprising:

2 receiving a markup language page including a conditional tag having an
3 expression including a URL and first markup language data to be
4 conditionally displayed according to the value of the expression;

5 fetching data associated with the URL;

6 evaluating the expression using the fetched data to determine a value of the
7 expression;

8 responsive to the value of the expression being true, displaying the markup
9 language page with the first markup language data; and

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responsive to the value of the expression being false, displaying the markup language page without the first markup language data.

26. The method of claim 25, wherein:

the conditional tag includes second markup language data; and
responsive to the value of the expression being false, displaying the markup language page without the first markup language comprises displaying the markup language page with the second markup language data.

27. A browser program product for controlling the operation of a wireless communication device by execution of the browser by a processor of the wireless communication device and displaying a page of markup language data, the browser executing the operations of:

receiving a markup language page including a conditional tag having an expression including a URL and first markup language data to be displayed according to the value of the expression;
fetching data associated with the URL;
evaluating the expression using the fetched data to determine a value of the expression;
responsive to the value of the expression being true, displaying the markup language page with the first markup language data; and
responsive to the value of the expression being false, displaying the markup language page without the first markup language data.

28. A computer implemented method for navigating a markup language page containing a plurality of hyperlinks, the method comprising:

receiving a markup language page including a plurality of hyperlinks;
selecting a hyperlink of the markup language page as a current hyperlink;

5 scrolling the markup language file in a direction on the screen display in
6 response to a user input to display only a portion of the markup
7 language file;
8 determining whether a next hyperlink in the direction of scrolling is visible;
9 responsive to the next hyperlink in the direction of scrolling being visible,
10 making next hyperlink the current hyperlink; and
11 responsive to the next hyperlink in the direction of scrolling not being visible,
12 scrolling a portion of the markup language file.

1 29. The method of claim 28, wherein:

2 the markup language page has an attribute specifying a target name of a
3 hyperlink included in the page; and
4 selecting a hyperlink of the markup language page as a current hyperlink
5 further comprises:
6 comparing the target name specified in the attribute with names specified
7 in each of the hyperlinks; and
8 selecting as the current hyperlink the hyperlink having a name matching
9 the target name.

1 30. A browser program product for controlling the operation of a wireless
2 communication device by execution of the browser by a processor of the wireless
3 communication device and displaying a page of markup language data, the browser
4 executing the operations of:

5 receiving a markup language page including a plurality of hyperlinks;
6 selecting a hyperlink of the markup language page as a current hyperlink;
7 scrolling the markup language page in a direction on the screen display in
8 response to a user input to display only a portion of the markup
9 language page;
10 determining whether a next hyperlink in the direction of scrolling is visible;

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responsive to the next hyperlink in the direction of scrolling being visible,
making next hyperlink the current hyperlink; and
responsive to the next hyperlink in the direction of scrolling not being visible,
scrolling a portion of the markup language page.

31. A computer implemented method for automatically displaying advertising
data to a user, comprising:

receiving a markup language page containing a <MARQUEE> tag including
displayable text in a header portion of the page, and a title;
displaying the markup language page in a window having the title in a title bar
area;
incrementing a counter of an elapsed amount of time; and
responsive to the counter equaling or exceeding a threshold amount of time,
replacing the title by scrolling the displayable text included in the
<MARQUEE> tag in the title bar area.

32. A browser program product for controlling the operation of a wireless
communication device by execution of the browser by a processor of the wireless
communication device and displaying a page of markup language data, the browser
executing the operations of:

receiving a markup language page containing a <MARQUEE> tag including
displayable text in a header portion of the page, and a title;
displaying the markup language page in a window having the title in a title bar
area;
incrementing a counter of an elapsed amount of time; and
responsive to the counter equaling or exceeding a threshold amount of time,
replacing the title by scrolling the displayable text included in the
<MARQUEE> tag in the title bar area.

33. A computer-implemented method of operating a wireless communications device having a screen display, a plurality of keys, including at least one softkey, and a plurality of configurable features that can be established by configuration settings, the method comprising:

a) receiving a first markup language page including at least one tag selected from a group of tags consisting of:

a first tag defining an association between a key and an action;

a second tag defining help data;

a third tag defining an association between a softkey and a menu of menu items, each menu item associated with either a URL or an action;

a fourth tag specifying a URL referencing a second markup language page;

a fifth tag accompany an escape sequence specifying a URL referencing a third markup language page;

a sixth tag defining an input field for receiving a user input of a configuration setting, and a selection attribute equal to the value of an expression including a URL for a configurable feature, the selection attribute indicating whether the input field is preselected;

a seventh tag having an expression including a URL and first markup language data to be conditionally displayed according to the value of the expression;

an eighth tag having attribute specifying a target name of at least one hyperlink included in the first markup language page; and

a ninth, <MARQUEE> tag including displayable text in a header portion of the first markup language page;

b) responsive to a tag in the first markup language being the first tag:

receiving a user selection of the key; and

effecting the action associated with the user selected key;

c) responsive to a tag in the first markup language page being the second tag:

storing the help data;

displaying the first markup language page in a window;
displaying a title of the first markup language page in a title bar area of the
window;
responsive to an elapsed amount of time since a last user input exceeding a
threshold, replacing the title in the title bar area by scrolling the
stored help data in the title bar; and
responsive to completion of the scrolling of the stored help data,
redisplaying the title in the title bar area;
d) responsive to a tag in the first markup language page being the third tag:
storing the association between the softkey and the menu of menu items;
responsive to receiving a user selection of the softkey, displaying the
menu of menu items;
responsive to user selection of a displayed menu item associated with an
action, effecting the action; and
responsive to user selection of a menu item associated with a URL, either
fetching data specified by the URL or effecting a communication
function of the wireless communication device specified by the
URL;
e) responsive to a tag in the first markup language page being the fourth tag:
fetching the second markup language page according to the URL;
replacing the fourth tag with the second markup language page to form a
combined markup language page; and
displaying the combined markup language page;
f) responsive to a tag in the first markup language page being the fifth tag:
fetching the third markup language page according to the URL;
replacing the escape sequence with the third markup language page to
form a combined markup language page; and
displaying the combined markup language page;
g) responsive to a tag in the first markup language page being the sixth tag:
fetching data associated with the URL;

60 evaluating the expression using the fetched data to determine a value of
 61 the expression; and
 62 displaying the first markup language page including the input field of the
 63 configuration setting according to the selection attribute as pre-
 64 selected or unselected according to the value of the expression;
 65 h) responsive to a tag in the first markup language page being the seventh tag:
 66 fetching data associated with the URL;
 67 evaluating the expression using the fetched data to determine a value of
 68 the expression;
 69 responsive to the value of the expression being true, displaying the first
 70 markup language page with the first markup language data; and
 71 responsive to the value of the expression being false, displaying the first
 72 markup language page without the first markup language data;
 73 i) responsive to a tag in the first markup language page being the eighth tag:
 74 selecting one of the hyperlinks of the first markup language page as a
 75 current hyperlink;
 76 scrolling the first markup language page in a direction on the screen
 77 display in response to a user input to display only a portion of the
 78 first markup language page;
 79 determining whether a next hyperlink in the direction of scrolling is
 80 visible;
 81 responsive to the next hyperlink in the direction of scrolling being visible,
 82 making next hyperlink the current hyperlink; and
 83 responsive to the next hyperlink in the direction of scrolling not being
 84 visible, scrolling a portion of the first markup language page; and
 85 j) responsive to a tag in the first markup language page being the ninth tag:
 86 displaying the first markup language page in a window having a title of the
 87 first markup language page in a title bar area;
 88 incrementing a counter of an elapsed amount of time; and

responsive to the counter equaling or exceeding a threshold amount of time, replacing the title by scrolling the displayable text included in the <MARQUEE> tag in the title bar area.

34. A browser program product for controlling the operation of a wireless communication device by execution of the browser by a processor of the wireless communication device having a screen display, a plurality of keys, including at least one softkey, and a plurality of configurable features that can be established by configuration settings, the browser executing the operations of:

- a) receiving a first markup language page including at least one tag selected from a group of tags consisting of:
 - a first tag defining an association between a key and an action;
 - a second tag defining help data;
 - a third tag defining an association between a softkey and a menu of menu items, each menu item associated with either a URL or an action;
 - a fourth tag specifying a URL referencing a second markup language page;
 - a fifth tag accompany an escape sequence specifying a URL referencing a third markup language page;
 - a sixth tag defining an input field for receiving a user input of a configuration setting, and a selection attribute equal to the value of an expression including a URL for a configurable feature, the selection attribute indicating whether the input field is preselected;
 - a seventh tag having an expression including a URL and first markup language data to be conditionally displayed according to the value of the expression;
 - an eighth tag having attribute specifying a target name of at least one hyperlink included in the first markup language page; and
 - a ninth, <MARQUEE> tag including displayable text in a header portion of the first markup language page;
- b) responsive to a tag in the first markup language page being the first tag:

- 27 receiving a user selection of the key; and
28 effecting the action associated with the user selected key;
- 29 c) responsive to a tag in the first markup language page being the second tag:
30 storing the help data;
31 displaying the first markup language page in a window;
32 displaying a title of the first markup language page in a title bar area of the
33 window;
34 responsive to an elapsed amount of time since a last user input exceeding a
35 threshold, replacing the title in the title bar area by scrolling the
36 stored help data in the title bar; and
37 responsive to completion of the scrolling of the stored help data,
38 redisplaying the title in the title bar area;
- 39 d) responsive to a tag in the first markup language page being the third tag:
40 storing the association between the softkey and the menu of menu items;
41 responsive to receiving a user selection of the softkey, displaying the
42 menu of menu items;
43 responsive to user selection of a displayed menu item associated with an
44 action, effecting the action; and
45 responsive to user selection of a menu item associated with a URL, either
46 fetching data specified by the URL or effecting a communication
47 function of the wireless communication device specified by the
48 URL;
- 49 e) responsive to a tag in the first markup language page being the fourth tag:
50 fetching the second markup language page according to the URL;
51 replacing the fourth tag with the second markup language page to form a
52 combined markup language page; and
53 displaying the combined markup language page;
- 54 f) responsive to a tag in the first markup language page being the fifth tag:
55 fetching the third markup language page according to the URL;

replacing the escape sequence with the third markup language page to
form a combined markup language page; and
displaying the combined markup language page;
g) responsive to a tag in the first markup language page being the sixth tag:
fetching data associated with the URL;
evaluating the expression using the fetched data to determine a value of
the expression; and
displaying the first markup language page including the input field of the
configuration setting according to the selection attribute as pre-
selected or unselected according to the value of the expression;
h) responsive to a tag in the first markup language page being the seventh tag:
fetching data associated with the URL;
evaluating the expression using the fetched data to determine a value of
the expression;
responsive to the value of the expression being true, displaying the first
markup language page with the first markup language data; and
responsive to the value of the expression being false, displaying the first
markup language page without the first markup language data;
i) responsive to a tag in the first markup language page being the eighth tag:
selecting one of the hyperlinks of the first markup language page as a
current hyperlink;
scrolling the first markup language page in a direction on the screen
display in response to a user input to display only a portion of the
first markup language page;
determining whether a next hyperlink in the direction of scrolling is
visible;
responsive to the next hyperlink in the direction of scrolling being visible,
making next hyperlink the current hyperlink; and
responsive to the next hyperlink in the direction of scrolling not being
visible, scrolling a portion of the first markup language page; and

j) responsive to a tag in the first markup language page being the ninth tag:
displaying the first markup language page in a window having a title of the
first markup language page in a title bar area;
incrementing a counter of an elapsed amount of time; and
responsive to the counter equaling or exceeding a threshold amount of
time, replacing the title by scrolling the displayable text included
in the <MARQUEE> tag in the title bar area.

35. A computer implemented method of navigating a page of data including at
least one selectable hyperlink, in a computer system including a screen display but not
including an independent cursor controlled by a peripheral pointing device; the method
comprising:

scrolling the page in a direction on the screen display in response to a user
input to display only a portion of the page; and
automatically and iteratively assigning a next visible hyperlink in the direction
of the scrolling and in the displayed portion of the page to a user
selectable key.

36. A computer implemented method of navigating a page of data including a
plurality of form fields, each form field having a type, in a computer system including a
screen display and a keypad having a plurality of keys, but not including an independent
cursor controlled by a peripheral pointing device; the method comprising:

scrolling the page in a direction on the screen display in response to a user
input to display only a portion of the data file;
determining whether a next form field in the direction of scrolling is visible;
responsive to the next form field in the direction of scrolling being visible,
making next form field a current form field for receiving a user input;
and
assigning an action for manipulating the current form field to a key of the key
pad according to the type of the current form field.

39. A computer-implemented method of data processing a page of data encoded in a markup language, the method comprising:

receiving a user selection of a displayed user interface element in the page, the element associated with a command encoded within the page, the command having a protocol component and a data component; and invoking the embedded object, and providing the command to the embedded object for processing, the embedded object processing the command using an internally defined function.

40. A wireless communication device, comprising:

- a screen display;
- a plurality of keys;
- a plurality of configurable features;
- a processor coupled to the screen display and the keys;
- a shell executed by the processor for receiving a URL having a protocol component and a data component, the data specifying a command to be executed or content to be fetched, the shell providing the data component to a protocol handler according to the protocol component, and the fetched content to a content handler for processing;
- a plurality of protocol handlers, each protocol handler executed by the processor and coupled to receive a URL from the shell and either fetch content specified by the data component and provide the fetched content to the shell, or execute the command specified by the data component; and
- a markup language content handler executed by the processor and coupled to the shell that receives markup language content corresponding to a URL and displays the content on the screen display, the markup language handler decoding markup language tags from a group comprising:
 - a key tag defining an action for one of the plurality of keys;

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means for effecting a telecommunication function in response to a user
input to a displayed user interface element.

42. An apparatus, comprising

first means for receiving a URL having a protocol component and a data
component, the data specifying a command to be executed or content
to be fetched, the shell providing the data component to a protocol
handler according to the protocol component, and the fetched content
to a content handler for processing;

a plurality of protocol handler means, each protocol handler means coupled to
the first receiving means to receive a URL and either fetch content
specified by the data component and provide the fetched content to the
shell, or execute the command specified by the data component; and

a plurality of content handler means, each content handler means coupled to
the first means to receive fetched content and process the fetched
content to output the content to a screen display.